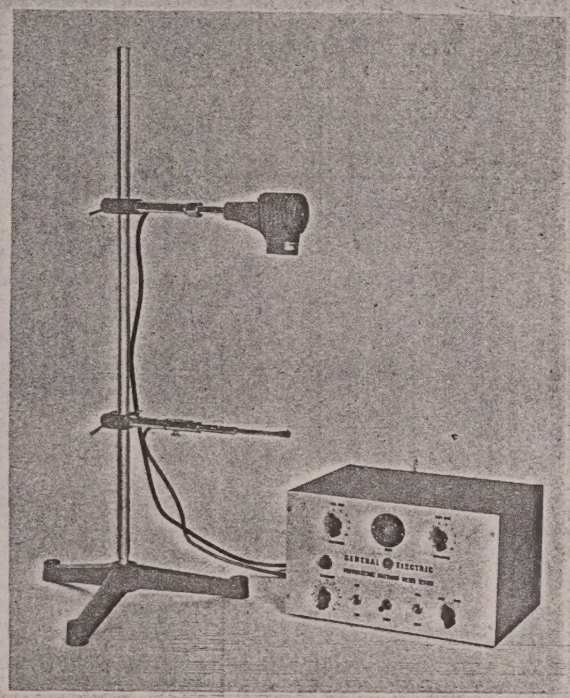
PRELIMINARY
INSTRUCTIONS

GEH - 277
(Temporary)

PHOTOELECTRIC
WATTHOUR-METER TESTER



CAT. NO. 4153711G7 TESTER

EQUIPMENT COVERED :

PORTABLE . . . . . CAT. NO. 4153711G7

SWITCHBOARD . . . . CAT. NO. 4153711G8

METER DEPARTMENT

GENERAL ELECTRIC

SOMERSWORTH, N. H.

MP MASTER
MA32667

3-64 (75)

Printed in U.S.A.

List of Equipment Covered*

Component	Catalog No. Portable Model	Catalog No. Switchboard Model
Complete tester equipment	4153711 G7	4153711 G8
Console (20 rev., 1 hole disk)	4153819 G106	4153819 G107+
Light source	9892785 G1	9892785 G1
Photocell pick-up probe	9892786 G5	9892786 G5
Clamp stand**	9688446 G1	9688446 G1

* Earlier console models (4153819 G100-104) used with photocell assembly 9892786 G4 are described by GEH-2772. Console models (4153819 G110, 4153819 G111) which are capable of counting 40 revolutions of a one-hole disk or one black line are covered by supplementary instructions.

\+ Consoles are available having front plates which will fit test panels cut out for the following older style consoles:

	Period of Manufacture
Cat. No. 9688462 G2, 3	1958-1962
Cat. No. 9692179 G2, 3	1954-1958
Cat. No. 493X99	1950-1954

** Optional wall-mounted bracket is available.

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These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

PHOTOELECTRIC
WATTHOUR-METER TESTER

INTRODUCTION

The most common method of determining the calibration of a watthour meter is to compare its speed to the speed of a watthour meter standard whose calibration is accurately known. With this method of test, the meter under test and the meter standard are connected to the same load, the meter standard being allowed to run for some predetermined number of test meter revolutions. Usually, the test meter runs continuously, and the meter standard is started and stopped by a precision switch whose opening and closing are controlled by the disk of the meter being tested.

This precision switch is contained in the console described in these instructions. Also described is the auxiliary equipment used with the console.

In addition to its use in watthour meter testing, the console and its auxiliary equipment can be used whenever there is a need for a switch which can be precisely closed and opened after some pre-selected number of pulses from a remote source.

RECEIVING AND HANDLING

Like any precision laboratory equipment, the console and other assemblies of the photoelectric tester should be unpacked and handled with care. If there is any evidence of shipping damage, a damage claim should be filed with the transportation company and the nearest General Electric Apparatus Sales Office should be notified.

DESCRIPTION OF COMPONENTS

Console

The console contains electronic circuits which receive change of resistance signals from the photocell. These signals are fed to, and displayed on, a counting tube. This tube energizes one relay to close the external circuit when the first impulse is received and energizes another relay to open the external circuit after pulses representing the pre-determined number of revolutions (set on the revolutions switch) have been received.

NOTE: The various electronic circuits will be discussed in the PRINCIPLES OF OPERATION section, page 16.

Earlier consoles with serial numbers 2522 to 2617 (described in GEH-2772) have two Amphenol two-wire connectors for use with photocell assembly 9892786 G4. New consoles described in this book (with serial numbers above 2617) have one Amphenol two-wire connector and one four-terminal connection block. This console may be used with either photocell assembly 9892786 G4 or G5.

Light Source Assembly

The light source assembly contains a 6.5-volt bulb (G-E Cat. No. 1493) and a glass collimating lens. The die-cast housing has a snap-out ventilated end cover for easy replacement of the bulb. The light-source housing can be slightly moved horizontally to align it with the photocell by loosening the small setscrew in the die-cast housing.

Photocell Pick-up Probe

This assembly contains a cadmium selenide photocell and miniature 5-volt lamp in the same housing (Fig. 3).

For the reflected light method of test the 5-volt lamp is switched on by turning the light-dark switch to the dark position. For the direct light method of test the 6.3 volt lamp in the light source assembly is switched on and the 5-volt probe lamp is switched off by turning the light-dark switch to the light position.

The photocell whose resistance changes with light is located directly below the round hole opening in the probe housing. For the reflected light method the probe is directed over or under the disk so that the black mark passes approximately half way between the light source and the long narrow slot.. When the black mark passes the probe, the reflected light being directed through the long narrow slot is blanked out, resulting in a photocell resistance change. For the anti-creep method the probe is positioned so that the spot of light directed through the anti-creep hole strobes across the round hole located within the target circle on the probe housing.

A large thumbscrew vernier adjustment, located at the clamp end of the assembly, is used to vertically align the cell. A large thumbscrew and "U" slot are used to rotate probe through 180° for above or below disk testing. Any angle between 0-180° may also be obtained for either edge of disk testing (black mark - dark position) or mirror light reflection (spot of light - light position).

Clamp Stand

The mounting rod and tripod base together comprise the clamp stand, which is used to mount and hold the photocell and light source assemblies when a flat horizontal surface is available adjacent to the meter.

NOTE: An optional wall-mounted bracket and rod is available in place of the clamp stand to support the photocell and light source from a wall or from the side of a test panel. It permits the rod with its light source and photocell to be swung in a horizontal arc.

INSTALLATION

Location

The tester should be located in a well-illuminated area free from vibration and dampness.

Mounting

The light source and cell units may be arranged in any manner that is desired to suit the particular meter under test.

The outline and mounting dimensions of the testers are shown by drawings 9889574 and 9889575.

Connections

Typical connection diagrams for single- and dual-meter testing are shown in Fig. 1 and 2.

The proper connections for testing watthour meters with a portable watthourmeter standard are as follows: (See Fig. 1.)

1. Connect the line cord to a 120-volt, 50-60 cycle power supply.
2. Connect the light-source cable to the light source socket on the control box.

   CAUTION: Do not attempt to connect two light sources to the control box at the same time, because the additional load may burn out the power transformer.

3. Connect the cadmium-selenide photocell cable to the terminal block.

   NOTE: Photocell assembly 9892786 G4 may be also used with this console; the round Amphenol socket provides the necessary connection.

4. Connect the portable watthour-meter standard to the standard meter terminals on the control box.

5. Refer to the section entitled OPERATION.

The phototester may also be used for dual-meter testing as shown in Fig. 2. When using this method, one meter may be running under test, while the technician is making adjustments or recording data. This converts running time into useful working time.

The five-pole, double-throw transfer switch shown in Fig. 3 may be of the cam-lever, locking type having a neutral center position, such as the model MCL, manufactured by the General Control Company, 1200 Soldier's Field Road, Boston 34, Massachusetts.

NOTE: The contacts in the phototester are rated at 1 ampere maximum, 240 volts maximum. Higher test currents and voltages require the use of an auxiliary relay. G-E CR2810A11AA2, 120-volt, 60-cycle, normally open contacts, open-type relay, or G-E CR2811A100A2, 120-volt, 60-cycle, normally open contacts enclosed relay are the ones recommended for this type of application. However, it should be noted that the use of an auxiliary relay will decrease the timing accuracy.

In multiple-meter testing, that is, when two or more potential circuits are connected in parallel to the phototester, the increased IR drop in the phototester-switching circuit may change the phase angle of the potential circuit.

This change may introduce an error in the 0.5 power factor test. The error introduced by this phase-angle shift may be in the order of 0.05% at full-load current, when two potential circuits are in parallel. The auxiliary relays previously noted may be used to reduce this error.

OPERATION

When the phototester is used to test watthour meters, there are two common methods for detecting disk revolutions:

1. Anti-creep hole method
2. Reflected light method

Anti-creep Hole Method (See Fig. 3)

For this method, which can be used with or without the meter cover in place, the following procedure is recommended. It is assumed the components have been connected as outlined in the CONNECTIONS section.

1. Turn console to "on" position by turning sensitivity switch to 5. A glow spot will appear in any location on the counter tube.
2. Set one/two switch to "one."
3. Set full/light toggle switch to "full" and rotary full load and light load revolutions selector switches to "off" positions (between 10 and 1).
4. Set light/dark switch to "light."
5. Vertically align the light source and photocell pick-up probe on the clamp stand so that the photocell is in the field of light from the light source.

Enough space should be left between the light source and the photocell so that, when the stand is moved near the meter, the light source will be above and the photocell below the meter disk.

6. Cover the photocell with a hand or an opaque object and depress and release the start switch on the console. (CAUTION: The start switch should always be released using a normal smooth return motion and not allowed to snap back. Snapping of the switch results in the console remaining in its off position. It's then necessary to depress the start switch a second time to start test.) A glow spot will appear opposite "R" on the "count" indicator.
7. Watch the neon indicator above the sensitivity switch and watch the counter tube and move a hand back and forth, interrupting the light beam. The glow spot on the counter tube should advance to "S" and then to 1, 2, etc., and neon indicator lamp should glow each time light passes over photocell.
8. Position the stand near the meter so that, as the meter disk rotates, the anti-creep holes in the disk will pass through the light from the light source.
9. Apply the maximum load expected during test (i.e., rated current, rated voltage, and 1.0 PF) to the meter, and then proceed to adjust sensitivity as described in Step 10.
10. Adjust sensitivity control as follows:

    a. Set control to 1.

b. Slowly rotate the control until the neon lamp glows and the light in the "count" indicator advances each time the beam of light passes through the anti-creep hole in the test meter disk. This position determines the approximate minimum sensitivity control setting.

c. After determining the minimum sensitivity control setting, rotate the control an additional major division. For example, if the minimum setting was found to be 3, the control should be set on 4. This setting will normally permit testing at light load (10% full load), full load, and inductive load (Full load with 0.5 PF) without resetting sensitivity between tests. However, due to variations in the anti-creep holes of meter disks, poor test conditions, wide range of disk speeds, and adjustment of the light source and photo-cell units, the setting may not always be satisfactory; and further adjustment of the sensitivity control may be necessary.

d. If the count does not advance for each anti-creep hole at both slow and fast speeds, increase the sensitivity setting in one-division steps until proper operation at both slow and fast speeds is obtained.

NOTE: For most conditions of anti-creep hole testing, it will be found that the minimum sensitivity setting will be at the lowest point on the scale (moving the sensitivity switch beyond the lowest point turns off power to console). This setting is

perfectly normal. The operator should experiment with various settings and meter test conditions so that a "feel" is obtained for the best sensitivity setting.

11. Proceed to calibrate the test watthour meter as described in the OPERATING PROCEDURE section, page 15.

Reflected-light Method (See Fig. 3)

The reflected-light method of testing may be used on any meter in which the photocell can be inserted above, below, or on the edge of the disk. The built-in light source provides the reflected light for the probe, resulting in an assembly which is not affected by varying ambient light conditions.

In general, a good rule to observe when testing by reflected light is one of providing a sharp contrast between the black reference mark and disk surface. For example, a wide dull black mark on a shiny disk provides the best condition, whereas a narrow faded black mark on an embossed dirty disk yields the poorest condition. It will save test time if faded black marks are restored by using a flat black paint, India ink, or a black pencil.

For most single-phase and polyphase meter disks the black mark on the bottom of the disk provides the best test condition because of (1) darkness of black mark, (2) width of black area, and (3) absence of lines, numbers, and an embossed surface.

After the necessary wiring has been completed (as described in the CONNECTION section, page 7), adjust the photocell pick-up probe as follows:

1. Insert probe and check to see that face of probe is parallel to disk surface.

2. Adjust the thumbscrew so that support arm is approximately horizontal and the distance from probe to disk is approximately 1/4 inch (this distance may be varied from 1/8 to 3/8 or more, depending on test conditions).
3. Move the stand in or out so that the black mark passes approximately half way between the 5-volt light source opening and the long narrow slot in the formed head of the probe.
4. Place rotary full load and light load revolutions selector switches in their off-scale positions (between 1 and 10), depress start switch, and then proceed to determine the best sensitivity control adjustment as described in Step 5.
5. Adjust the sensitivity control for reflected light operation as follows:
   a. Energize the console by turning the sensitivity control knob to position 10, the light/dark switch to "dark," and the one/two switch to "one."
   b. Apply the maximum load expected during test (maximum RPM of disk).
   c. Rotate sensitivity control counterclockwise until the minimum point is found where the neon indicator glows and the count advances each time the black reference mark passes beneath the probe. This position determines the minimum sensitivity control setting.
   d. After the minimum sensitivity control setting is determined, advance the sensitivity approximately one full division.

This setting will normally permit testing at light load, full load, and inductive load without resetting sensitivity between tests. For greater ranges of speed (5%-667% test ampere load), or when dirty disks and faded or chipped reference marks are encountered, further adjustment of the sensitivity control or the position of the photocell may be necessary. In this case, readjustment as outlined in Steps 3, 4, and 5 may be necessary.

If the neon indicator bulb glows continuously, it may be caused either by the console being in its end-of-test condition (stop relay energized which disconnects photocell input) or the probe is out of position, such as being off the edge of disk or too far away from disk. Correct condition by depressing start switch and checking location of probe relative to disk.

NOTE: The 5-volt lamp used in the probe is a long-life bulb rated for 40,000 hours' operation at 5 volts. The variable resistor R-59 in series with the lamp is set by our factory to yield exactly 5 volts with 120V, 60 cycles on primary of console power transformer. The probe is designed to provide optimum performance at these settings. It may prove advantageous to the user to readjust the trimmer pot (R-59) to maintain the 5 volts on lamp if the equipment is not to be used on a

regulated line and it's known that the nominal supply voltage will be between 108-115 or 125-132 volts, 60 cycles. CAUTION: Do not adjust trimmer pot so that lamp voltage will be continuously operated above 5 volts, for this will result in a shorter life of the lamp since lamp life is approximately proportional inversely to the 13th power of the lamp voltage.

6. Proceed to calibrate the test watthour meter as described in the OPERATING PROCEDURE section.

OPERATING PROCEDURE

Light-Load Test

Adjust the switches on the console as follows:

1. Set the light load revolutions switch to the number of test-meter disk revolutions to be checked.
2. Set the full/light switch to the "light" position.
3. Set the light/dark switch to the "light" position for the anti-creep hole method of test and to the "dark" position for the reflected-light method of test.
4. Set the one/two switch to agree with the number of anti-creep holes in the watthour meter disk.
5. Push the start switch. The glow in the "count" indicator should go to the "R" position and advance as pulses are received from the photocell. The neon indicator light should go off and then glow each time a pulse is received from the photocell.

Full-Load Test

Adjust the switches on the console as follows:

1. Set the full load revolutions switch to the number of test meter disk revolutions to be checked.
2. Set the full/light switch to the "full" position.
3. Set the light/dark switch to the "light" position for the anti-creep hole method of test and to the "dark" position for the reflected-light method of test.
4. Set the one/two switch to agree with the number of anti-creep holes in the watthour meter disk.
5. Push the start switch. The glow in the "count" indicator should go to the "R" position and advance as pulses are received from the photocell. The neon indicator light should go off and then glow each time a pulse is received from the photocell.

PRINCIPLES OF OPERATION

Each pulse from the photocell enters a Schmitt trigger circuit (see Fig. 4) which shapes the pulse into a square wave. The sensitivity control biases one of the grids in the Schmitt trigger circuit to compensate for pulse intensity. This square wave is then coupled to a cathode follower, when the one/two switch is in position "one," or to a binary stage and then to a cathode follower when the one/two switch is in position "two."

The binary stage is a bistable multivibrator circuit which divides the pulses from the Schmitt trigger by two; in other words, two pulses into the binary circuit result in a single pulse out. This is used when a meter with

a two-hole disk is being tested, so that the whole revolutions are always counted.

The cathode follower is used as a coupling device between a high-impedance source and a low-impedance load. The output from the cathode follower is coupled to the drive circuit of the cold cathode counting tube. The plate voltage of the cold cathode tube is 450 volts d-c, which is closely regulated by the voltage regulator tubes (0A2WA).

The drive circuit converts pulses from the signal source into waveforms on the guide electrodes such that each in turn becomes the most negative. This causes the neon glow to transfer from one cathode to another, thus indicating the number of disk revolutions of the meter under test. When the glow reaches the final position, as preselected by the operator, it remains in this position until the start switch is pushed for another test.

The cold cathode counting tube provides nearly the same function as the mechanical stepping switch of older model photoelectric testers. A signal output may be obtained from each of its twelve cathodes. The cathode indicated by an "R" is the reset position that the glow assumes when the start switch is pushed. The first pulse advances the glow from the reset position to the "S" position. This is the start position for the meter standard. The output of this cathode is coupled directly to V-8 (No. 2D21 thryatron tube) which energizes relay RA-2, closing the potential circuit of the meter standard.

The outputs of cathodes 1 through 10 are connected to both of the revolutions selector switches and the load selector switch. The signal from the load selector switch is coupled directly to V-7 (a No. 2D21 thyratron tube) which energizes relay RA-1, opening the potential circuit of the meter standard.

The potential circuit of the watthour meter standard is closed and opened by the closure of two separate relays, RA-1 and RA-2, to increase timing accuracy by eliminating the difference between pick-up time and release time of a single relay.

MAINTENANCE

Light Source Lamp

1. Disconnect the light source unit from the control box.
2. Loosen the setscrews in the rear of the housing assembly.
3. Remove the snap-out cover on the end of the housing assembly and then push the tubing through the opening to expose the lamp and socket assembly.
4. Remove the lamp, install the new one, and then reassemble the unit in the reverse order. Be sure to position the lamp directly above the lens so that the light beam will be parallel with the support rod.

Replacement of 5-Volt Lamp Assembly, Cat. No. 5461050

Replace the 5-volt lamp as follows: Refer to Fig. 5.

1. Remove thumbscrew (3) from probe housing (5), loosen the Allen head setscrew (4), and push shielded cable (2) into probe housing (5). Loosen slotted setscrew (6) so that photocell housing (7) is also free.
2. Insert the end of a paper clip in the elongated hole on side of photocell housing (7) and push forward on photocell and lamp assembly (8). Then grasp end of photocell

and lamp assembly (8) until it is free of photocell housing (7).

3. Remove lamp assembly (9) by unplugging terminals. Replace with new lamp assembly and check operation by connecting leads to proper terminals on rear of console.
4. Reassemble unit as follows:
   a. Assemble photocell and lamp assembly (8) to photocell housing (7).
   b. Retract shielded cable (2) from probe housing (5) and then reinsert after tightening down slotted setscrew (6) which holds photocell housing (7) to probe housing (5).
   c. Tighten Allen head setscrew (4) on brass ferrule so that the shielded cable (2) is held securely in place.

Photocell Pick-up Probe, 9892786 Gr. 5

The photocell used in this probe is basically the same cadmium-selenide cell used in previous photocell assemblies. If it's necessary to replace a photocell, then order a sub-assembly catalogue number 9926675 which includes photocell and lamp assembly (8), Fig. 5, and a photocell housing (7).

The resistance range of the photocell should be as follows:

Resistance is checked with an ohmmeter across terminals 2 and 3 of photocell pick-up probe.

1. With 5 volts on lamp assembly terminals 1 and 4, position probe 1/4 inch away from test watthour disk. Resistance of cell to be 50K to 200K.

2. Place black tape over slot in probe and with 5-volt lamp energized the disk resistance should be greater than 50 megohms.

Lubrication

The only moving part in the console which may require periodic lubrication is the start switch. If switch begins to stick, then lubricate surface between nylon button and spring with Liqui-Moly MV grease, G.E. specification D50W88.

TROUBLE SHOOTING

When incorrect operation is first noted, it is often possible to reduce overall servicing time by studying all the symptoms. The trouble can usually be isolated by the process of elimination if the circuit functions are clearly understood.

The following trouble-shooting procedure is recommended:

1. Test the electronic tubes; this can be done by use of an ordinary radio tube tester. An alternate method is fo substitute tubes known to be good and note any changes in operation.
2. Check for loose connections or shorted wires.
3. Check resistance and voltages at pins of tubes against those listed below. D.C. voltages should be measured with a vacuum-tube voltmeter. A.C. voltages should be measured with an A.C. voltmeter having a sensitivity of at least 1,000 ohms per volt. Resistance should be measured using any ohmmeter.

4. Check continuity of the circuit using an ohmmeter.

Voltage and Resistance Checks

Console:

The following voltage and resistance measurements are made from the indicated point to chassis ground. The measurements should be made with a volt-ohmmeter having a resistance of 10,000 ohms per volt d-c.

It should be noted that the values given are approximate and that the normal tolerances on components make variations in the readings possible.

The console should be set up as follows before making the measurements.

1. Input voltage 120 volts, 60 cycles
2. Photocell unit connected to the console with the photocell completely covered
3. The light/dark switch in the "light" position
4. The one/two switch in the "one" position
5. The full/light switch in the "full" position

Voltage Measurements

Tube	Pin	Voltage
V1, 0A2WA	1	440 ±5 VDC
V2, 0A2WA	1	295 ±5 VDC
V3, 0A2WA	1	150 ±5 VDC
V4, 6D10	2	230 VDC
V4, 6D10	5	125 VDC
V4, 6D10	9	95 VDC (glow must be in the reset position)
V4, 6D10	9	225 VDC (when both relays are energized)
V4, 6D10	11	60-75 VDC (1 to 10 on sensitivity control)
V5, 12AU7	1	75-125 VDC plate swing
V5, 12AU7	6	75-125 VDC plate swing
V7, 2D21	6	385 VDC relay RA1 open
V7, 2D21	6	125 VDC relay RA1 closed
V8, 2D21	6	400 VDC relay RA2 open
V8, 2D21	6	160 VDC relay RA2 closed
V6, GS12D	G-1 yellow	30 VDC
V6, GS12D	G-2 green	30 VDC
V6, GS12D	Anode	250 VDC

Resistance Measurement

CAUTION: Be sure unit is not attached to the power line.

Tube	Pin	Resistance
V4, 6D10	2	34K
	3	15K
	4	85K
	5	52K
	6	15K
	7	25K
	9	225K
	10	225K
	11	225K-805K, light/dark switch in light position 2.25 meg.-3.5 meg., light/dark switch in dark position
V5, 12AU7	1	70K
	2	110K
	3	15K
	6	70K
	7	110K
	8	15K
V7, 2D21	1	20 meg. or greater
	2	20K
	5	20K
	6	55K
	7	20K
V8, 2D21	1	20 meg. or greater
	2	20K
	5	20K
	6	42K
	7	20K
V6, GS12D	G-1 yellow	75K
	G-2 green	170K
	Anode	950K
Switch 7	pos. 1 to 10	270K $\pm$ 20K

TROUBLE-SHOOTING CHART

Trouble	Probable Cause	Remedy
No power to control box.	1. Line cord not plugged in outlet.	1. Check to be sure cord is plugged in.
	2. No fuse or burned-out fuse in control box.	2. Check fuse and replace if defective.
	3. Open coil in transformer.	3. Check windings for continuity and replace transformer if defective.
	4. Defective on-off switch.	4. Check switch continuity and replace if defective.

Trouble	Probable Cause	Remedy
No impulses being received by GS12D code cathode counting tube.	1. Improper connections or setting of switches.	1. Check and readjust per "connection," "initial operation," and "operating procedure" sections of this book.
	2. Photocell jack not plugged into socket properly.	2. Check to be sure jack is plugged in properly.
	3. Light not striking window in photocell unit.	3. Readjust equipment per "initial operation" section.
	4. Sensitivity control switch set too low or too high.	4. Readjust control per "initial operation" section.
	5. Defective tubes.	5. Check tubes and replace if defective.
	6. Reflected-light method of testing, not enough light striking photocell.	6. Use light source unit to obtain more light.
	7. Light bulb is not centered so that light cannot be adjusted to strike photocell.	7. Readjust light bulb per "repair and replacement" section.
	8. Defective photocell unit.	8. Check per "repair and replacement" section and replace if defective.
	9. Dirty contacts in light/dark switch.	9. Clean contacts or replace switch.
	10. Leads from photocell shorted to shielding in cable.	10. Check for short and repair or replace cable if defective.
	11. One/two switch defective.	11. Check for proper operation. Replace if defective.
	12. Diode (D-4) defective.	12. Replace if defective.
	13. Relay RA1 contact resistance too high.	13. Replace if defective or switch positions with other relay.
Extra impulses being received by counting tube.	1. Defective 0A2WA regulator tube.	1. Check tubes; replace if defective.
	2. Defective filter capacitor, C-1.	2. Replace if defective.
	3. Defective Schmitt circuit check 6D10.	3. Check tube, replace if defective.
	4. Sensitivity control switch may be adjusted too low or too high.	4. Readjust control per "initial operation" section.
	5. Line voltage exceeding ±10% of 120V 50-60 cycles.	5. Check line voltage; if too low, increase by most convenient means available. A voltage regulator or autotransformer are satisfactory.
	6. Improper ground connections in circuit.	6. Check circuit continuity.
	7. Reflected-light method of testing; shadows or side light striking photocell.	7. Adjust photocell unit per "initial operation" section.

APPLICATIONS

In addition to the previously described normal testing of watthour meters, other applications of this equipment include the following:

1. It can be used for checking the accuracy of rotating standards by the primary-standard method. In this test, the rotating standard is started and stopped by the photoelectric tester, with the timing obtained by reflected-light impulses from a small mirror mounted on the pendulum of a standard clock.
2. It can be used with a portable standard or secondary standard to start and stop meters in gang testing. An auxiliary relay is required for this type of test to carry the current of the several potential coils. Timing errors are slightly increased with this method.
3. The synchronous-clock method of testing watthour meters can also be used. In this case the load on the meter is carefully held to a predetermined value, and the synchronous electric clock operating on constant frequency is started and stopped in the same way as a rotating standard.

RENEWAL PARTS

Electronic parts such as tubes, resistors, and capacitors may best be obtained from local distributors. Any component may be obtained from our factory by sending the catalogue number of the console along with the identification of the component as given on the schematic diagram.

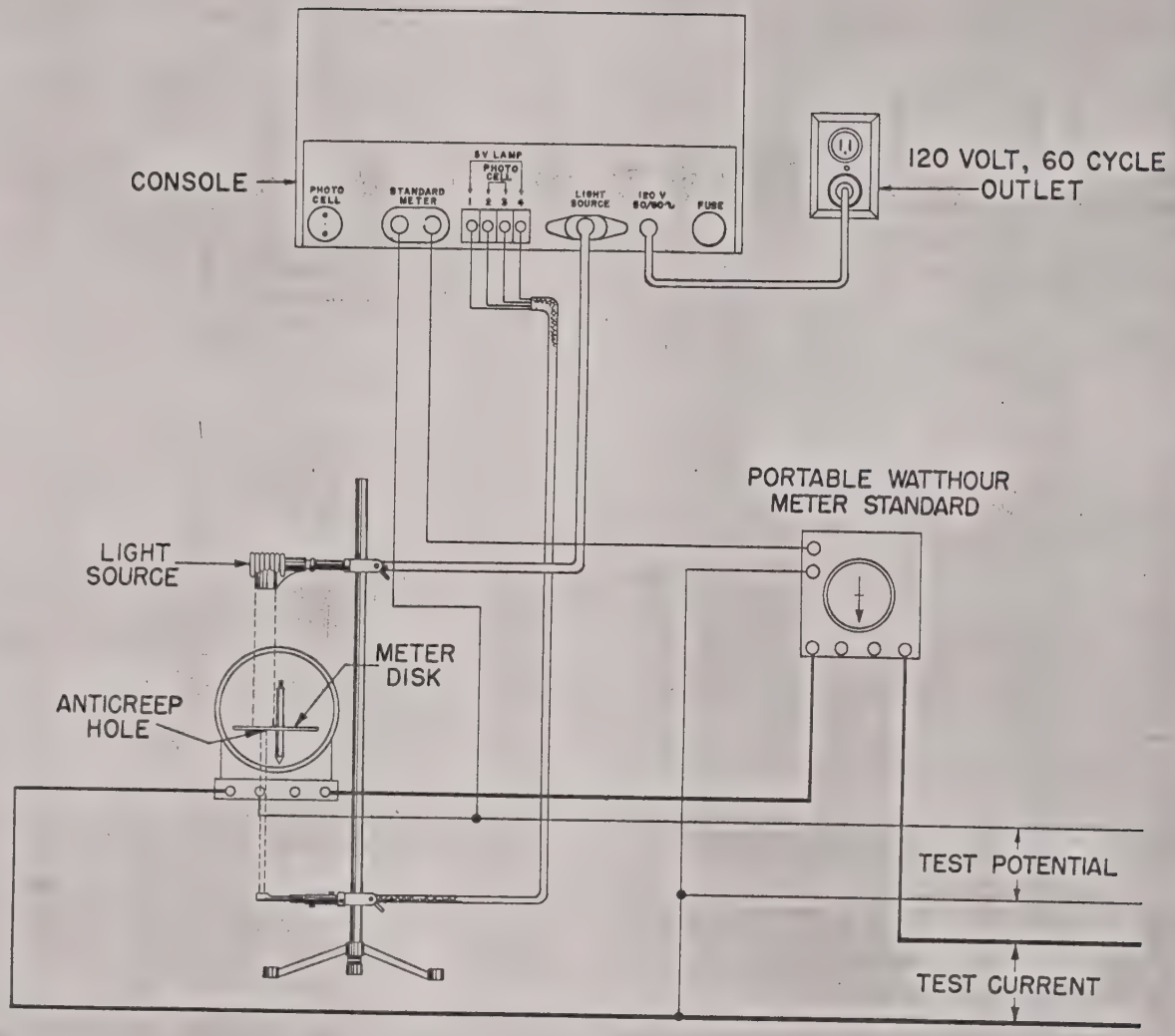


Fig. 1. Typical Connection Diagram for Single-meter Testing

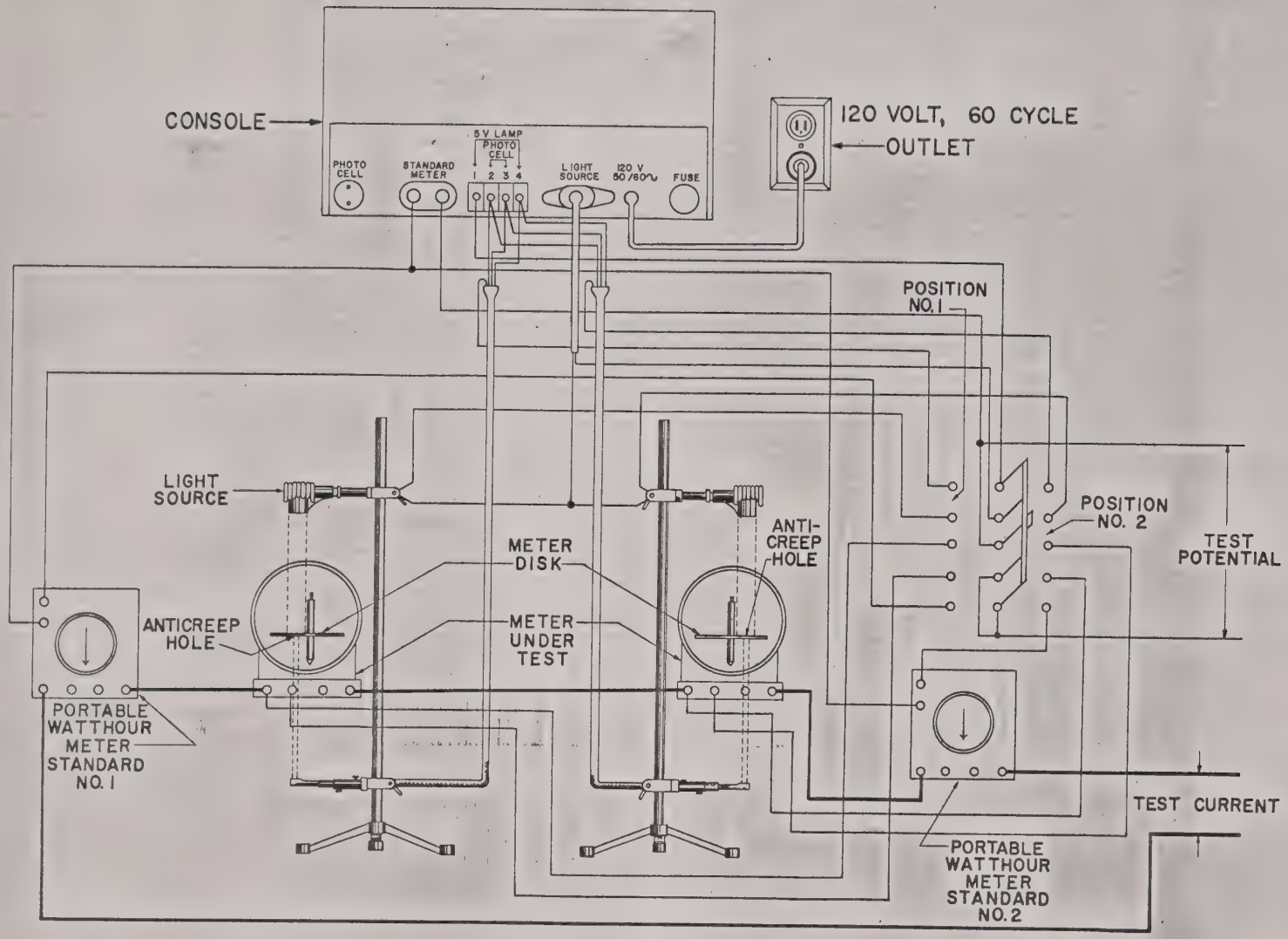


Fig. 2. Typical Connection Diagram for Dual-meter Testing

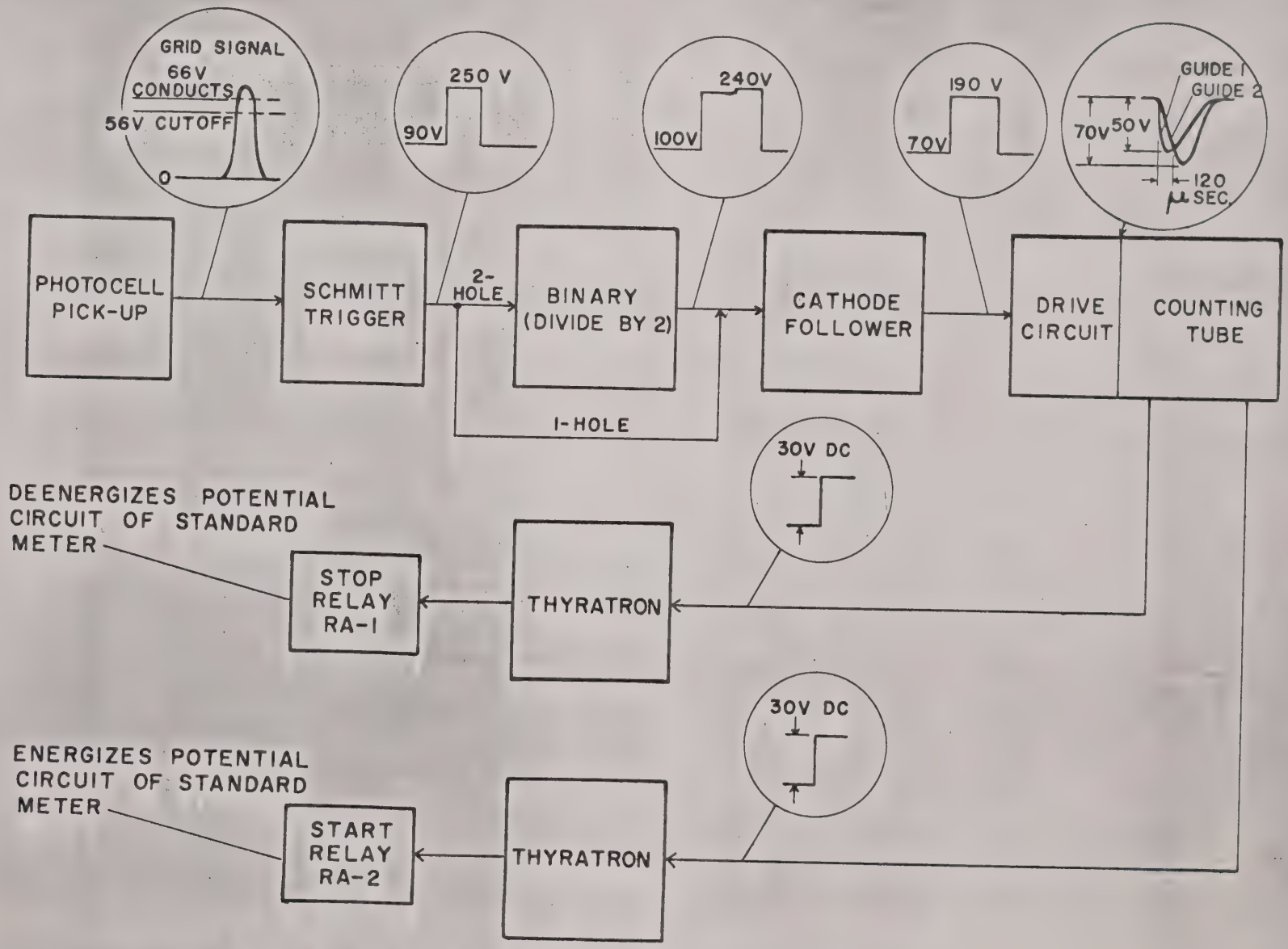
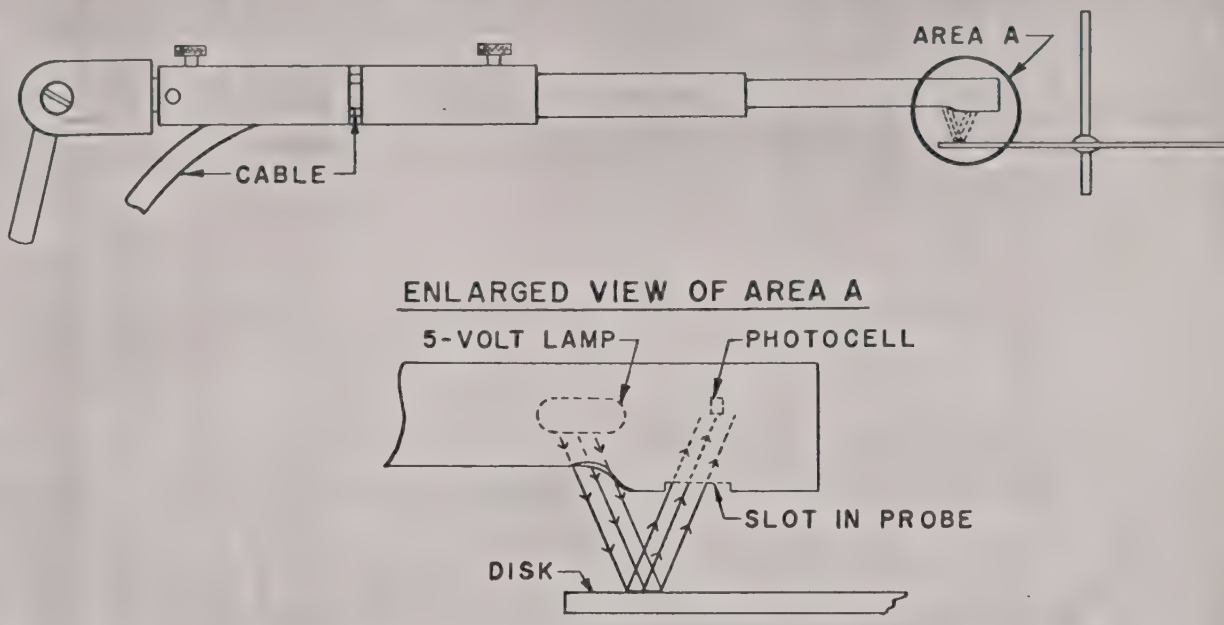
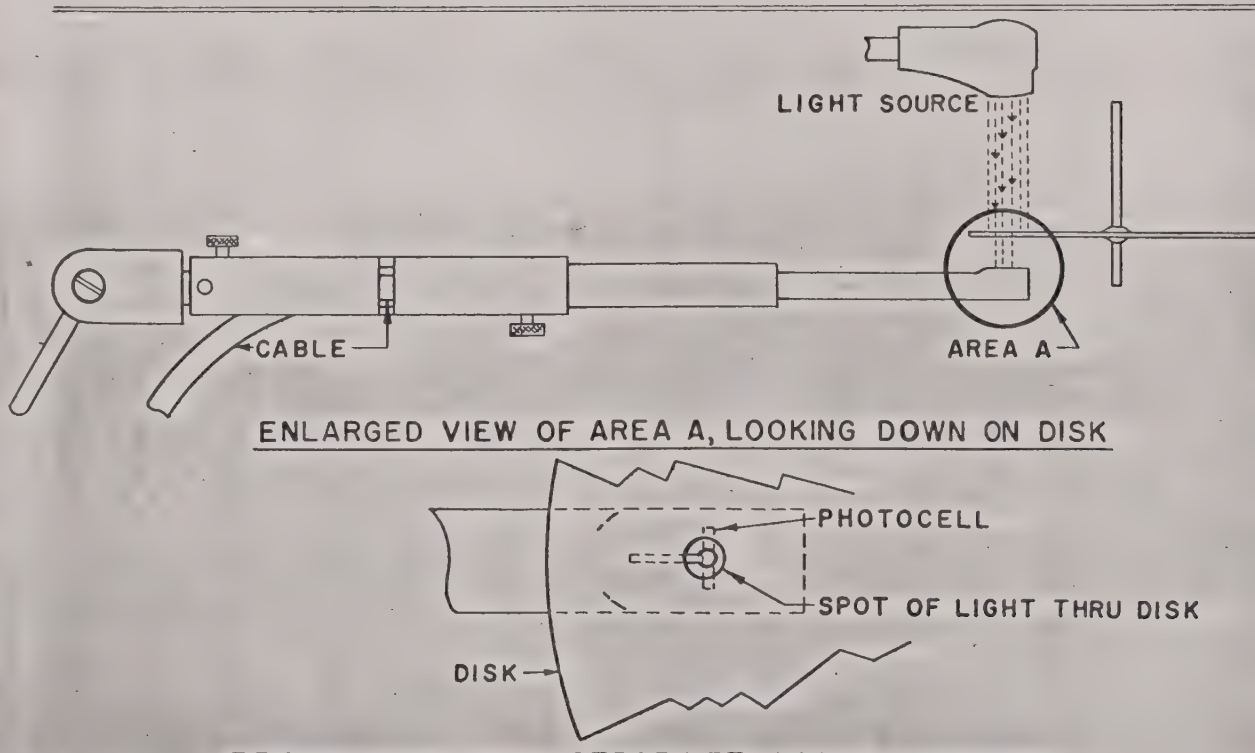


FIG. 4. BLOCK DIAGRAM & WAVE FORMS



PROBE UNIT USING REFLECTED-LIGHT METHOD



PROBE UNIT WITH SEPARATE LIGHT SOURCE
USING ANTICREEP-HOLE METHOD

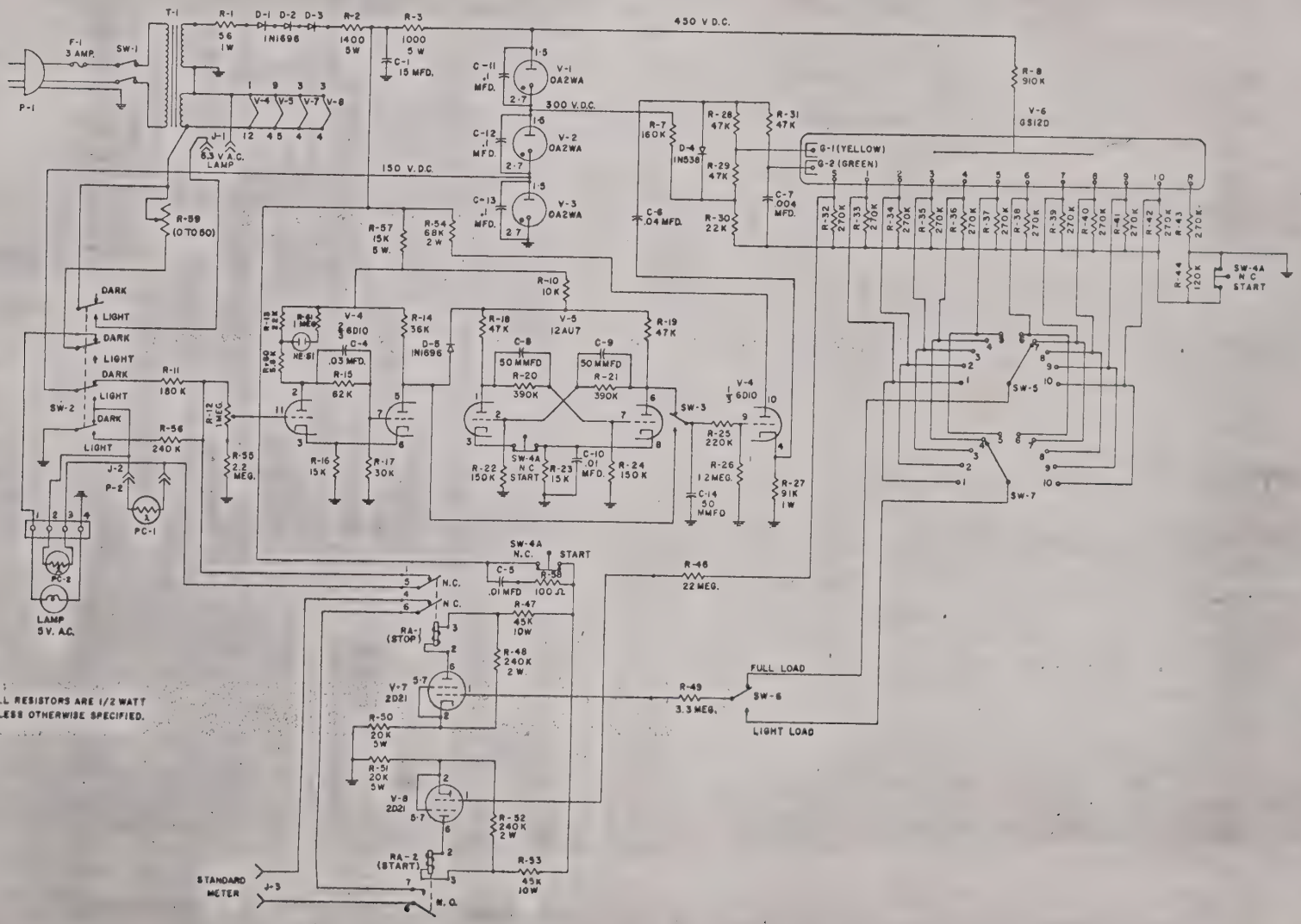
Fig. 3. Illustration of Light Source and Probe Unit Test Positions

GENERAL ELECTRIC

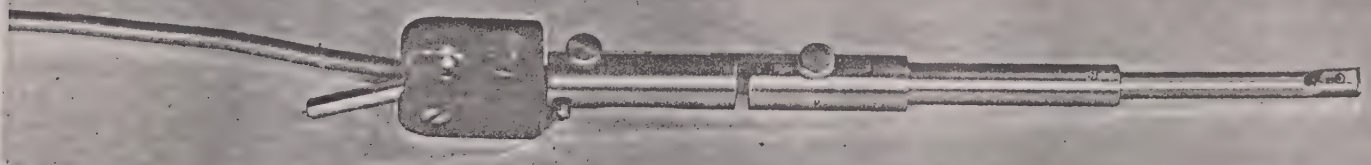
C 5461033

TITLE SCHEMATIC FOR
WATTHOUR METER TESTER (10/20 REV.)

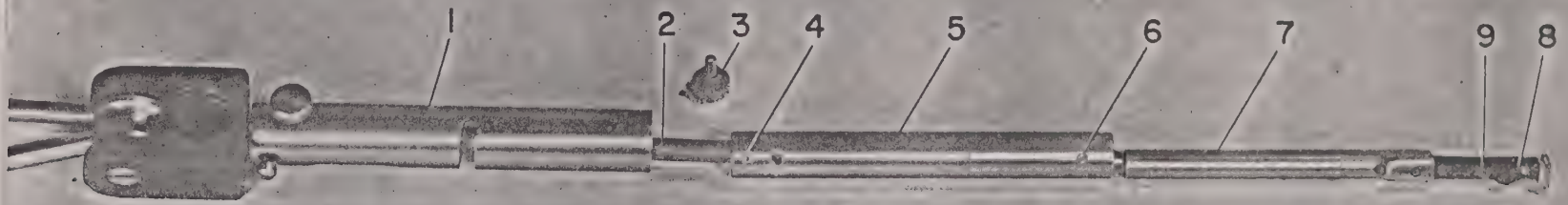
FIRST MADE FOR CAT. NO. 4153711 G,7,8,8



NOTES:
1. ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED.



COMPLETE PROBE ASSEMBLY



UNIT DISASSEMBLED FOR REPLACEMENT OF LAMP

FIG. 5. PROBE LAMP REPLACEMENT PROCEDURE

GENERAL ELECTRIC

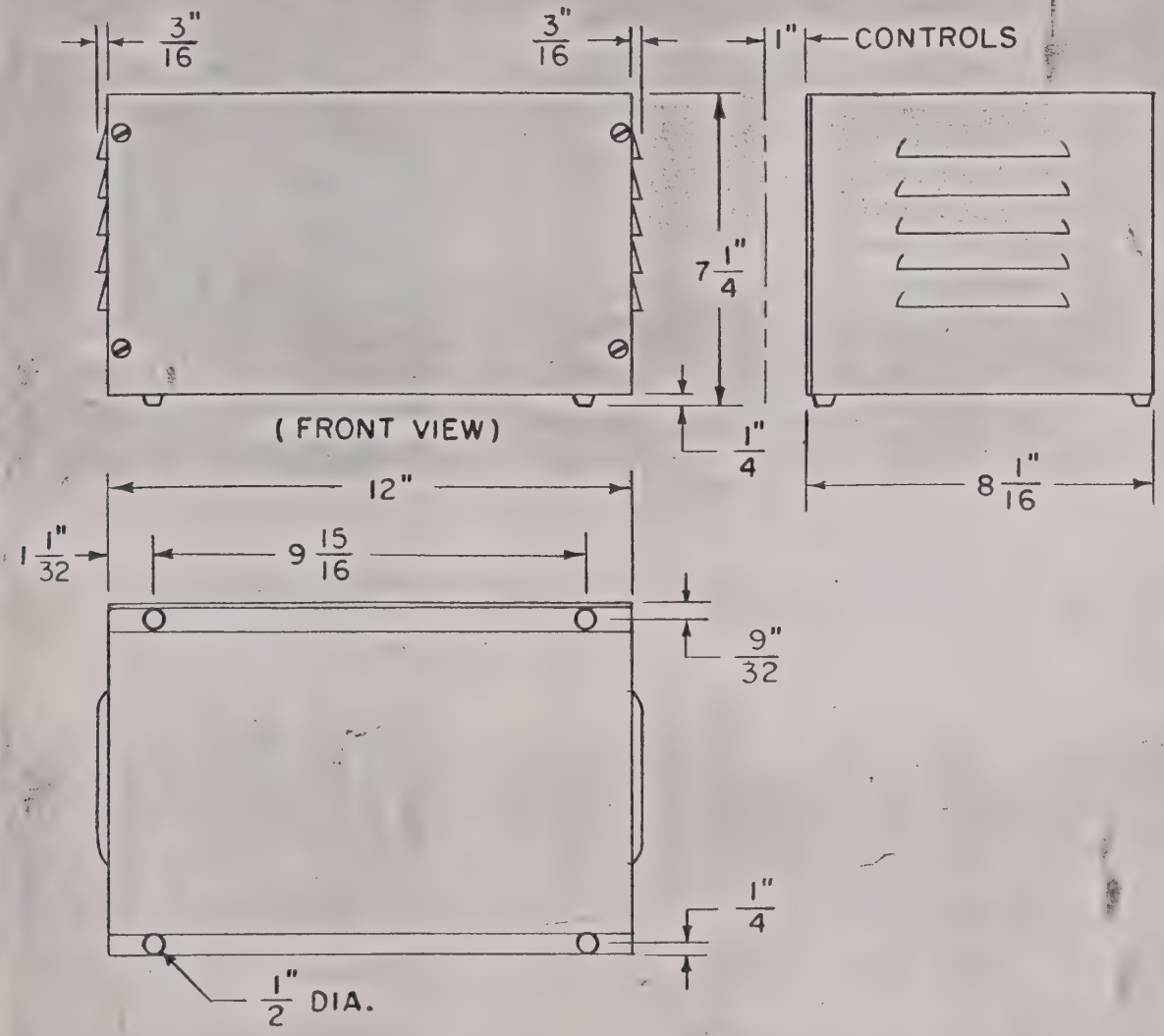
A 9889574
CONT ON SHEET SH NO.

REV NO.

A 9889574
CONT ON SHEET SH NO.

TITLE

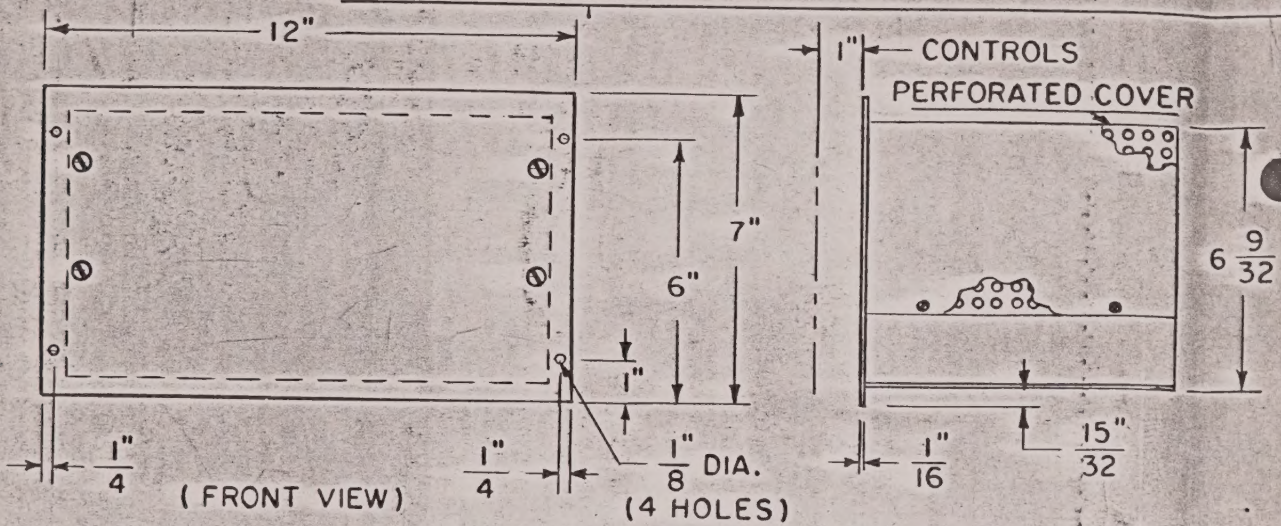
OUTLINE
PHOTOELECTRIC TESTER
PORTABLE MODEL

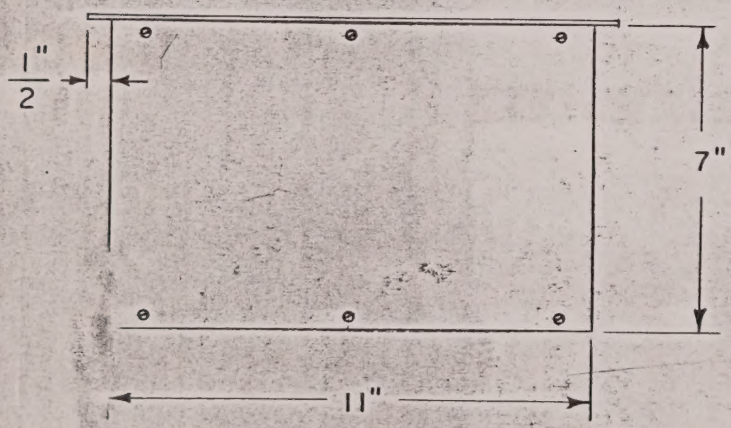


GENERAL ELECTRIC

REV NO.	TITLE
A 9889575 CONT ON SHEET SH NO.	OUTLINE PHOTOELECTRIC TESTER SWITCHBOARD MOUNTED

A 9889575 CONT ON SHEET SH NO.





MP MASTER
MA32667